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UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH ADMINISTRATION
BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE

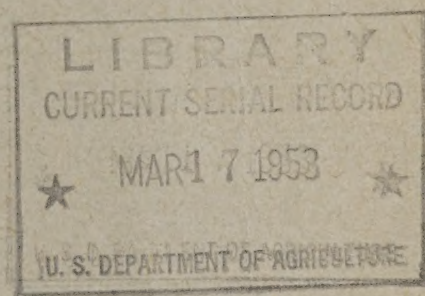
Project

Date

Author

TITLE

PROGRAM FOR CALENDAR YEAR 1952



UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH ADMINISTRATION
BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE
DIVISION OF CEREAL AND FORAGE INSECT INVESTIGATIONS
EUROPEAN CORN BORER INVESTIGATIONS
WORK PROJECT I-e-3

and

IOWA AGRICULTURAL EXPERIMENT STATION
DEPARTMENTS OF AGRONOMY,
AGRICULTURAL ENGINEERING, HORTICULTURE, ZOOLOGY AND ENTOMOLOGY
COOPERATING
PROJECT NO. 1193

COOPERATIVE PROGRAM FOR CALENDAR YEAR 1952

LIST OF PRINCIPAL COOPERATING AGENCIES

California:

California Institute of Technology. (Translocation Studies)
University of California. (Insect Diseases)
Agricultural Experiment Station. (Distribution Records)

Canada:

Science Service. (Parasite Colonization)

Connecticut:

Agricultural Experiment Station. (Surveys)(Parasite Field Status)

Delaware:

Agricultural Experiment Station. (Surveys)(Parasite Field Status)

Guam:

Department of Agriculture. (Parasite Colonization)

Illinois:

Illinois Natural History Survey. (Surveys, Parasite Field Status)
(Resistance Investigations)
Agricultural Experiment Station. (Surveys)(Resistance Investigations)

Indiana:

Purdue Agricultural Experiment Station. (Resistance Investigations,
Parasite Field Status, and Surveys)

Iowa:

Agricultural Experiment Station. (All research)
State Department of Agriculture. (Parasite Colonization and Field
Status)(Surveys)

Kansas:

Entomological Commission. (Surveys)
Agricultural Experiment Station. (Parasite Colonization and Field
Status)(Resistance Investigations)

Kentucky:

Agricultural Experiment Station. (Surveys, Parasite Field Status)

Maine:

State Department of Agriculture. (Surveys)
Agricultural Experiment Station. (Parasite Field Status)

Maryland:

State Department of Agriculture. (Surveys, Parasite Colonization
and Field Status)
Agricultural Experiment Station. (Surveys, Parasite Colonization
and Field Status)

Massachusetts:

Agricultural Experiment Station, Amherst. (Surveys)

Michigan:

Agricultural Extension Service. (Parasite Field Status)(Surveys)

Agricultural Experiment Station. (Resistance Investigations)

Minnesota:

State Department of Agriculture. (Surveys, Distribution Records)
(Parasite Colonization and Field Status)

Agricultural Experiment Station. (Parasite Colonization, Parasite
Field Status, Resistance Investigations)

Missouri:

State Department of Agriculture. (Surveys)

Agricultural Experiment Station. (Surveys, Parasite Colonization
and Field Status)(Resistance Investigations)

Nebraska:

Agricultural Experiment Station. (Parasite Colonization and Field
Status)(Resistance Investigations)

Agricultural Extension Service. (Surveys)

New Hampshire:

State Department of Agriculture. (Parasite Field Status)

Agricultural Experiment Station. (Surveys)

New Jersey:

State Department of Agriculture. (Surveys, Parasite Field Status)

New York:

State Department of Agriculture. (Surveys, Parasite Field Status)
Agricultural Experiment Station, Geneva. (Surveys, Parasite Field
Status)

North Carolina:

State Department of Agriculture. (Surveys)

Agricultural Experiment Station. (Parasite Field Status)

North Dakota:

Agricultural Experiment Station. (Surveys, Parasite Colonization
and Field Status)

Ohio:

Agricultural Experiment Station. (Surveys, Resistance Investigations)
(Parasite Field Status)

Oklahoma:

Agricultural Experiment Station. (Parasite Colonization)

Pennsylvania:

Agricultural Extension Service. (Parasite Field Status)(Surveys)
State Department of Agriculture. (Surveys)(Parasite Field Status)

Rhode Island:

Department of Agriculture and Conservation. (Surveys)(Parasite
Field Status)

South Dakota:

Agricultural Experiment Station. (Surveys, Parasite Colonization
and Field Status)

Tennessee:

State Department of Agriculture. (Surveys)(Parasite Colonization
and Field Status)

U. S. Bureau of Plant Industry, Soils, and Agricultural Engineering.
(Resistance Investigations, Insecticide Application Equipment)

U. S. Bureau of Entomology and Plant Quarantine, Division of Insecticide
Investigations. (Insecticide Investigations)

U. S. Bureau of Entomology and Plant Quarantine, Division of Beneficial Insects.
(Parasite Colonization)

Vermont:

State Department of Agriculture. (Surveys)

Virginia:

Virginia Truck Experiment Station. (Parasite Field Status)
State Department of Agriculture. (Parasite Field Status)
Agricultural Experiment Station. (Parasite Field Status, Surveys)

West Virginia:

State Department of Agriculture and Agricultural Experiment Station.
(Surveys, Parasite Colonization and Field Status)

Wisconsin:

State Department of Agriculture. (Surveys, Parasite Field Status)
Agricultural Experiment Station. (Parasite Field Status)(Resistance
Investigations)

The Agricultural Experiment Stations of a number of states have contributed
lines of corn for resistance testing.

RESISTANCE INVESTIGATIONS
Ankeny, Iowa and Toledo, Ohio

UNITED STATES DEPARTMENT OF AGRICULTURE

Bureau of Entomology and Plant Quarantine

Line	Project	I-e-3-1	Resistant varieties of field corn
Line	Project	I-e-3-2	Resistant varieties of sweet corn
Line	Project	I-e-3-3	Factors responsible for resistance
Line	Project	I-e-3-4	Egg production for use in variety tests

F. F. Dicke and W. D. Guthrie, Ankeny, Iowa
C. A. Crooks, Toledo, Ohio

Bureau of Plant Industry, Soils, and Agricultural Engineering

Work Project d-1-2 Corn Production, Breeding, Disease
and Quality Investigations

G. F. Sprague, Lowell Penny and P. A. Miller

IOWA AGRICULTURAL EXPERIMENT STATION

W. S. Haber, Dept. of Horticulture
J. C. Eldridge, Dept. of Agronomy

State Agricultural Experiment Stations
Cooperating

PROGRAM FOR CALENDAR YEAR 1952

INVESTIGATIONS AT ANKENY, IOWA

(F. F. Dicke and W. D. Guthrie of the Bureau of Entomology and Plant Quarantine, and G. F. Sprague and Lowell Penny of the Bureau of Plant Industry, Soils and Agricultural Engineering)

Field Corn Resistance

R-1 Promising Experimental Inbred Extractions from Single and 3-way Crosses.

Purpose: To further test and select among the cultures retained from the testing and breeding program conducted at Ankeny, Iowa in 1950 and 1951.

Procedure: Under an infestation supplemented uniformly by artificial infestation in an early planting, simulating first brood attack, to rate and make selections of low infestation plants. The lines WF9, M14, Oh45 and W22 will be used as standards for comparison. Approximately 68 cultures from the field corn nursery will be tested.

R-2 Missouri, Kansas and Nebraska Lines Crossed on a Single Cross Common Tester.

Purpose: To evaluate promising lines being developed in the breeding programs located at the Missouri, Kansas and Nebraska Agricultural Experiment Stations.

Procedure: It is planned to locate this test in southwestern Iowa where it will be reasonably close to points where these states are conducting district experiments. The objective of this arrangement is to provide the agronomists and entomologists an opportunity to observe their material under borer infestation. It is planned to artificially infest the plots with eggs from the Ankeny Field Station.

R-3 Tests of Experimental Hybrids Originating from Experiment Stations of the North Central Region for Relative Resistance and Tolerance.

Purpose: To test and compare new experimental hybrids which are being proposed for regional approval as "AES" hybrids in the North Central Region with several known to have good resistance. AES has been adopted as a symbol for such hybrids.

Procedure: To artificially infest, simulating first brood attack and to make comparisons by means of visual ratings on differential leaf and sheath feeding. Records on tolerance including stalk breakage and other agronomic qualities will be taken at or near maturity.

Dissections will be made in several entries including extremes in susceptible and resistant hybrids to determine the relative populations of surviving larvae.

R-4 Sweet Corn Resistance.

Purpose: To find sources of high resistance to the survival of European corn borer larvae. Transferring resistance factors from known resistant lines; to develop more highly resistant new lines from crosses among known resistant lines (intensification); to develop synthetics from known resistant lines for breeding lines of high resistance; to evaluate breeders' lines for their information and as possible sources of high resistance.

Procedure: Entries will be tested directly in the nursery plots, where a sample at one end of the plots will be artificially infested. All entries will be evaluated for relative degree of leaf feeding and ear infestation.

Nursery plots of W. A. Huelsen, Illinois Agricultural Experiment Station, Urbana, Illinois, will have available inbred entries of Bantam, Country Gentleman, and Evergreen sweet corn lines. The material will include the lines found promising in the 1951 tests. The work on sweet corn resistance in Iowa in 1952 will be carried on in the nursery plots of E. S. Haber of the Department of Horticulture of Iowa State College.

R-5 Popcorn Resistance.

Purpose: To find sources of germ plasm in corn for high resistance to the survival of larvae and tolerance to the European corn borer and to evaluate the borer reaction of lines for the information of the breeder.

Procedure: A sample of plants of each test entry will be artificially infested in the whorl stage of growth. The entries will be evaluated for relative degree of leaf feeding and stalk breakage. Observations on second brood reactions will be made if an infestation develops.

The work will be carried out in the nursery planting of J. C. Eldredge of the Iowa Agricultural Experiment Station and in a special planting at the Illinois Agricultural Experiment Station in cooperation with G. C. Decker of the Illinois Natural History Survey and W. L. Weaver of Department of Horticulture of the Illinois Agricultural Experiment Station.

Factors Responsible for Resistance

R-6 Studies of Rates of Larval Development and Pupation on a Group of Inbred Lines and Hybrids.

Purpose: To obtain information on the biology of the borer in relation to the morphological and physiological characteristics of the corn plant as it applies to research on resistance. This information is fundamental for determining where and what breeding efforts should be stressed.

Procedure: A selected group of inbreds and a few hybrids will be planted at Ankeny, Iowa. Plants will be infested with a known number of eggs and larval development and rate of pupation will be determined by dissections. Detailed records will be taken on plant parts attacked by the larvae. It is planned to delay planting to avoid complications of natural infestation in studying the larval habits during the second generation infestation. It is also contemplated to expand our information on the habits and development of larvae during the period of second brood attack.

R-7 Effect of Certain Inbred Lines of Field Corn on the Biology of the Corn Borer.

Purpose: To obtain information on the effect of some commonly used inbred lines, known to yield significant differences in the levels of surviving larvae, on the biology of the insect when reared on the same lines through successive generations.

Procedure: In 1951 a sample of moths collected from the large moth emergence cage were individually caged. Eggs from individual moths were placed on the inbred lines WF9 and L317. The resulting full grown larvae were recovered during the first week of September, weighed, isolated externally disinfected with merphonyl nitrate, and placed in cold storage. A total of 18 recoveries from L317 survived and 22 recovered larvae from WF9 survived. It is planned to return the progeny of these larvae to their respective host line, and if an adequate number of egg masses are produced to make interchanges. Due to the small number of recovered larvae, it is also planned to obtain eggs produced by moths originating from the large emergence cage. The lines are to be grown in large blocks to reduce contamination of the larval stocks to a minimum.

Egg Production

R-8 Mass Production of Eggs.

Purpose: To provide large numbers of egg masses for manual infestation of corn being tested for borer resistance.

Procedure: Corn stalks heavily infested with larvae are caged in the fall to procure moths in the following season.

INVESTIGATIONS AT TOLEDO, OHIO
(C. A. Crooks)

Resistant Varieties of Field Corn

R-9 Testing of Lines Submitted by State and Federal Agencies.

Purpose: Rating experimental and released lines of field corn for relative resistance.

Procedure: Experimental lines and lines released for use in the production of commercial hybrids originating mostly from the Northern States of the North Central Region will be rated for relative resistance and the information made available to the cooperating agencies. In conjunction with the visual infestation ratings, records on other qualities, such as stalk breakage and other plant characters will be made at or near harvest time.

R-10 Evaluation and Selections in Sprague's #1 Corn Borer Synthetic and in Two Minnesota Synthetics.

Purpose: To isolate resistant strains from synthetic varieties produced from resistant and tolerant lines.

Procedure: The selection of resistant lines from this source has not been too successful. However, 45 lines have been selfed from the various synthetics and will be planted ear to row the coming season. The S₃ plants with low infestations will be selfed after the plots have been visually rated and are within the range of desired resistance.

R-11 Test of Selections in Derivatives of a Stiff Stalk Synthetic Produced at the Illinois Agricultural Experiment Station.

Purpose: To test and select lines from the promising extractions of the remaining cultures of this synthetic.

Procedure: A total of 15 entries from the most promising lines extracted from five families will be tested ear to row for selfing in the low infested plants.

R-12 Isolation of Resistant Plants in F₃ Populations Originating from Single and Three-Way Crosses Between Resistant Lines.

Purpose: To isolate individual plants on the basis of low infestation.

Procedure: About 100 selections representing 7 families will be planted ear to row this season. Some of these lines possessed resistance to leaf and sheath feeding, whereas others showed resistance and tolerance to stalk infestation. This material has now been advanced to the F₃ stage of inbreeding, the F₂ selections having been made in rather large plant populations.

R-13 Test of Extracting Resistant Lines from the Ohio Three-Way Hybrid (M14 x A206) x Oh4C.

Purpose: To isolate resistant extractions by selective selfing.

Procedure: To test ear to row promising extractions for additional improvement in resistance. Thirty selections from 10 cultures grown in 1950 will be grown in 1952.

R-14 Test of Survival and Pupation Between the Parents and Promising Extractions of Minnesota-Toledo Single Cross (A344 x L317).

Purpose: To compare the amount of improvement obtained through selective selfing for resistance and other desirable characters.

Procedure: To compare the relative resistance ratings of the parent inbreds with 5 inbred extractions. The artificial infestation will be applied with a selected number of uniform egg masses in the mid-whorl stage of growth. At or near the completion of the first brood pupation, samples will be taken and dissection of plants made to determine the survival and amount of pupation present.

R-15 Cooperative Test to Evaluate the Damage Caused by the First and Second Generation of Corn Borers to Dent Corn. In cooperation with E. T. Hibbs, Ohio Agricultural Experiment Station.

Purpose: To measure the amount of damage, or reduction in yield, by first and second generation of borers in an early and late planting of two commonly-grown double cross hybrids, one relatively resistant and the other susceptible.

Procedure: The cooperative program initiated in 1951 with the Ohio Experimental Station will be continued in about the same manner as in the previous season. Only minor changes will be made to increase the efficiency of the various items under consideration.

The various borer levels will be obtained by the use of an artificial infestation in both the first and second generations. The availability of egg masses will determine the number of borer levels finally obtained. The zero levels will be obtained by the use of Parathion throughout the oviposition periods. A natural level will also be established for comparison purposes.

R-16 Cooperative Testing of Sweet and Dent Corn at Lafayette, Indiana.

Purpose: To evaluate relative resistance in sweet and dent corns in breeders nurseries.

Procedure: Pinned egg masses will be sent to Lafayette to artificially infest the most promising sweet corn entries in Mr. Glen Smith's nursery and certain dent corn strains in Dr. A. M. Brunson's nursery. Mr. B. T. Everly will supervise these infestations.

The breeding phases, will be done by Dr. Brunson. The evaluations in the back crossing program will be made in his nursery by sending egg masses from the Toledo, Ohio Station for these purposes. The advanced generations will be tested at Toledo for further plant selections.

INSECTICIAL INVESTIGATIONS
Ankeny, Iowa

Line Project I-e-3-5	Insecticidal Materials, Laboratory Tests.
Line Project I-e-3-6	Insecticidal Sprays, Field Tests. 1/
Line Project I-e-3-7	Insecticidal Dusts, Field Tests. 1/
Line Project I-e-3-8	Insecticide Application Equipment 1/

T. A. Brindley and D. D. Questel
Ankeny, Iowa

Insecticidal Materials, Laboratory Tests.

I-1 Screening of New Compounds in Laboratory at Ankeny, Iowa for Evaluation as Corn Borer Insecticides.

Purpose: To find new materials supplied by the Division of Insecticide Investigations and from other sources, which might be useful as corn borer insecticides.

Procedure: The established, standard laboratory technique will be used in screening those compounds.

I-2 Comparison of New Potential Insecticides in Small Field Plot Tests.

Sprays

Purpose: To determine small plot tests, the insecticidal efficiency of DDT with compounds which have shown high toxicity to corn borer larvae in laboratory tests.

Procedure: Materials found promising in laboratory tests will be sprayed on field corn plants using a gasoline engine powered, wheel barrow sprayer. Plots will be 3 rows wide and 20 feet long and will be randomized and replicated 5 times. Each insecticide treatment will be applied twice in the same block. Some materials will be tested at more than one dosage rate. Dissections will be made when the borers reach full growth. The insecticides to be tested will be limited to approximately 12.

Dusts

The same materials, where possible, will be applied as dusts to small plot field tests. Additional multi-purpose dusts will also be tested. Application will be made with a wheel barrow mounted hand duster with a gasoline powered air compressor. Plot layout will be similar to the spray tests or incorporated with them. Dissection of corn plants to determine borer populations will be made when the borers reach full growth.

1/Conducted in cooperation with the Agricultural Engineering Department of Iowa Agricultural Experiment Station and the Bureau of Plant Industry, Soils, and Agricultural Engineering, Division of Farm Machinery, Pest and Plant Disease Control Machinery Laboratory, Toledo, Ohio.

I-3 Timing of Insecticidal Applications for First Brood Borer Control.

Purpose: To determine the best time to apply insecticides with relation to oviposition, egg hatching, egg load, corn development, appearance of leaf injury and number of sprays.

Procedure: Single and double applications of DDT emulsion will be made to early planted field corn at seven day intervals throughout the first brood egg laying and hatching period. The same schedule of treatment will be duplicated on corn planted 10 days after the early corn.

Plots will be 4 rows wide (11.67 feet) and 120 feet long. Each treatment will be replicated five times for each date of planting.

Oviposition and plant development data will be taken regularly on tagged plants. The tagged plants are to be dissected at 7 day intervals to determine the ages of larvae present at the time of spraying.

Larvae counts and yield records are to be taken from the center 40 feet of each plot.

I-4 Evaluation of promising insecticides on large plot basis.

Purpose: The purpose of this experiment will be to evaluate a few of the new insecticides on a large plot basis.

Procedure: A few of the new insecticides, probably Dilan 711, heptachlor, 269 and EPN-300 will be tested. Applications will be made by field type equipment to plots 3 rows wide and 1950 feet long. Each material will be tested at 5, 10, and 20 gallon rates at concentrations found to be satisfactory in small plot tests. Materials will be applied in emulsion form. Each treatment will be replicated 4 times. The efficiency of the applications will be determined by dissections of 10 stalks of corn from each plot when the borers reach the 4th or 5th instar.

I-5 Insecticide Residue Studies:

Purpose: The purpose of these experiments is to determine the distribution, quantity, and duration of residue deposits on corn following their application for corn borer control.

Procedure: Samples will be gathered from the various experiments after consultations with Jack Fahey.

I-6 Improvement of spraying and dusting equipment.

This work will be carried on in cooperation with the Agricultural Engineers of the Iowa Agricultural Experiment Station and the B.P.I.S.A.E. of the U. S. Department of Agriculture. Work in 1952 will center on the development of a new type of high clearance sprayer and an improved type of boom. Work on the sprayer was initiated in 1951.

The Agricultural engineers will also service all spraying and dusting equipment used on the experimental program.

PARASITE INVESTIGATIONS
ANKENY, IOWA AND MOORESTOWN, NEW JERSEY

Line Project I-e-3-9	Parasite Biology
Line Project I-e-3-10	Parasite Colonization
Line Project I-e-3-11	Parasite Field Status

K. D. Arbuthnot, Ankeny, Iowa; D. W. Jones
and S. W. Carter, Moorestown, New Jersey

P-1 Parasite Biology.

Purpose: To add to the general knowledge of the biology of parasites as an aid in planning more efficient releasing techniques for the species and to explain the success or failure of the various species in certain localities.

Procedure: Study the information accumulated from special study localities and from extensive areas to learn the requirements for successful establishment and maintenance of the various species.

A continuation of studies at the Saylor Township, Polk County, Iowa study point to determine which parasite species survived there from 1951 releases and to obtain information on the biology and host relationships affecting the parasites.

Study under controlled conditions the biology of exotic species established in widely separated areas but not generally successful in some extensive areas to learn whether there is evidence of the development of races in the isolated establishments. Evidence of differences would indicate that the survivors in a region where the species was not generally successful might be better adapted to the environment than those from other regions and should be used for intraregional colonizations. This information is needed, especially on Horogenes punctorius Roman in Eastern States, northwestern Ohio, Benton County, Iowa and Le Sueur County, Minnesota, and Macrocentrus gifuensis Ashm, in Eastern States and Bremer County, Iowa and elsewhere.

Study under controlled conditions, parasites from different foreign areas to determine whether there is evidence of racial differences between those from various areas as an aid in explaining different reactions when they are released in America.

Study the biology and seasonal history of parasites and their relation to host biology wherever a species is established. Obviously Bureau personnel are not located advantageously for doing this in many areas, and States are encouraged to make these studies especially as problems for graduate students. This type of information may provide the basis for improved techniques for colonizing parasites, provide explanations for the behaviour of the parasites in different regions where they are variably successful and basic information on the effect of parasites on host populations.

P-2 Parasites other than Insect Forms.

Purpose: Identification of biological forms causing borer death, the development of techniques suitable for determining their role in reducing borer populations and possible means of increasing their effectiveness.

Procedure: Submitting to specialists dead borers which may have been killed by disease for identification of the organisms. (Dr. Steinhäus, University of California, has been very helpful and cooperative in this phase of the work). The testing of procedures to provide specimens suitable for diagnosis and the adaptation of them to field survey investigations. Consideration should be given to initiating laboratory and field studies on the use of diseases, indigenous or introduced, for control of the pest.

Parasite Colonization

P-3 Colonization of Exotic Parasite Species.

Purpose: To continue the testing of parasites, including those species established in the United States and other exotic forms which may become available from importations, over additional parts of the corn borer infested area by establishing study points in recently invaded areas especially where different environments prevail. To assist in the distribution of parasites in cooperation with interested states and at their expense.

Procedure: Production of parasites for releases in areas where the various species have not been tested from collections taken where exotic species are established in America and from importations. Maryland and Minnesota are the only states providing funds for extensive releases in 1952. The government of the Island of Guam provided funds for collecting borers from heavily parasitized areas. The borers were shipped to the Island for processing to obtain parasites. Colonization in other states will be confined to releases at study points.

Domestic sources of material providing parasites this year are hibernating corn borer larvae collected; in Connecticut to provide principally Macrocentrus gifuensis and, some Chelonus annulipes Wesm., Horogenes punctorius and Lydella stabulans grisescens R.D., will come from them; in New Jersey to provide L. stabulans grisescens and H. punctorius. Importations from Europe will provide Campoplex alkae Ell. S. Sacht., and Microgaster tibialis Nees., from hibernating cocoons and hibernating corn borer larvae are expected to provide some Apanteles thompsoni Lyle and L. stabulans grisescens.

All rearing will be done at the Moorestown laboratory and shipment of adult parasites will be by air express. Most of the releases will be made by State personnel.

PARASITE FIELD STATUS

P-4 Summer Survey.

Purpose: To continue a long time study on established parasites in four Eastern study areas located at East Hartford, Connecticut, Taunton, Massachusetts and at Atlantic and Burlington, New Jersey. The continuation of the study started last year in Boone County, Iowa to learn the role of parasites as one of the ecological factors affecting host populations in the Corn Belt.

Procedure: The interactions between species and their relationship to host populations in the area are being studied by the accumulation of data over a long period of years in the Eastern areas. A similar study is in progress (started in the spring of 1950) as part of an ecological study of the host, in Boone County, Iowa where all stages, except eggs, taken in the ecological study will be collected and reared. Lydella stabulans grisescens and Sympeisis viridula were the only exotic species taken here in 1950 and 1951, accounting for less than one percent of the borers, and neither species has been released in the county. All of these studies are made by taking samples from a polar coordinate arrangement of placement.

P-5 Fall Studies.

Purpose: To provide current information on; establishment, dispersion, abundance and effectiveness of parasites as an aid in controlling the pest. The accumulated information is used in planning future colonization programs, as a guide for advising States interested in extensive colonizing and as a measure of the effectiveness of the parasites.

Procedure: The program for field work will be formulated in consultation with State agencies to obtain the greatest amount of information from the efforts of State and Bureau personnel. The Bureau plans to process all collections which the states can obtain, thus enabling all State effort to be used in making collections. Collections fall into three general categories.

Those taken from special study localities from a uniform pattern of sampling used continuously for several years and these are divisible into two types, one, where parasites are established and two, where parasites are believed not to be present. Boone County, Iowa started in 1950 and Waseca County, Minnesota started in 1951, are in this category. Similar studies are proposed in Smith County, Kansas. (Host population studies are to be made in these counties before exotic parasites become a factor affecting the host and continued after they become a factor).

Those taken at release sites to determine whether or not released parasites became established and if they survived after initial establishment.

Those taken without regard to colonization sites, whether from a regular sampling technique to determine the prevalence of parasites in extensive areas, or, from miscellaneous collecting points wherever they can be taken providing principally information on dispersion.

P-6 Disease Studies

Purpose: To initiate a study of the biology, distribution and importance of the microsporidian, Perezia pyraustae Paillot, as an inhabitant of the European corn borer. The study is inspired by the prevalence of the organism as originally found by Dr. E. A. Steinhaus of Berkeley, California in dead larvae sent him for diagnosis from this laboratory and as found in several hundred larvae examined by Mr. Zimmack and staff members at Ames.

Procedure: The study to be set up as a part of the cooperative program between Iowa State College and the Bureau of Entomology and Plant Quarantine. The proposed lines of investigation and assignments shall be as follows:

1. Biology of the organism shall be studied by a graduate student assigned by Iowa State College. The Bureau shall aid in this study through procurement of material for study, providing transportation when necessary and within practical limitations. Information on biology may be used by the assigned student for thesis work, but also made available to both agencies in furthering research activities that may be affected by this organism.
2. Distribution of the organism. Every effort will be made to determine distribution of the organism in the North Central States. The State of Iowa shall be surveyed under Dr. Harris' direction, and other states will be invited to send material to the cooperative research laboratory for diagnosis. Joint facilities will be used in the diagnosis of material provided.
3. The study and evaluating of the affects of this organism on experimental field and laboratory investigations on the European corn borer will be made at the cooperative research laboratory, and full use will be made of techniques developed by either of the two cooperating agencies.

Line Project I-e-3-12
Line Project I-e-3-14

Seasonal Development
Effect of Climatic Factors, etc.

C. A. Henderson, Bureau of Entomology & Plant Quarantine, Ankeny, Iowa, and L. D. Coleman, Dept. of Zoology & Entomology, Iowa Agricultural Experiment Station, Ames, Iowa

B-1 Observations at Boone County, Iowa.

Purpose: To obtain basic data on the occurrence development and habits of the European corn borer and their relation to corn growth, farm practices and prevailing weather conditions, and to determine the abundance of parasites and predators.

Procedure: Regular observations on the seasonal development of the corn borer will be continued in the Boone County, Iowa, study area. These observations will be confined to Boone County proper and will include 88 corn fields obtained through a restricted random selection procedure which was followed in 1950. Field sampling will be the same as in 1950. Investigations will include the developmental stages of the borer, such as pupation, emergence, oviposition, borer infestation and populations. These data will provide information on seasonal development, population fluctuations, parasites, predators, and related crop and meteorological developments in relation to corn borer control through population reductions.

B-2 Observations on factors influencing borer abundance in two areas in Iowa.

Purpose: To obtain data on the ecological factors influencing the development of the corn borer in Southeastern Iowa and Northwestern Iowa. Data gathered may help to explain why the borer is much more abundant in the northwestern area than in the southeastern portion of the state.

Procedure: Summer assistants stationed in the two areas will gather data similar to that collected in the Boone County Study Area. Observations in the two areas will be synchronized so that the data collected will be comparable and can be directly compared.

B-3 Relationship between the development of the corn plant and borer establishment.

Purpose: The object of this experiment will be to determine the relationship between the development of the corn plant and borer establishment.

Procedure: Three varieties of corn will be planted on three different dates in small plots. The varieties used will probably be HyXW22, a resistant single cross; Wf9X187-2 a susceptible single cross; and IoChief a hybrid sweet corn. The plantings will be artificially infested with 100 eggs at 24", 36" and 48". Dissections will be made 5, 10, and 20 days after infestation to determine establishment. Data will be gathered on the natural height of the corn, the extended height, tassel bud development, number of leaves, and the amount of borer feeding. This study will be carried out by Ross Watson as a thesis problem.

B-4 Corn borer population studies.

Purpose: The purpose of this study will be to determine the nature of the distribution of corn borer populations in order to ascertain the proper analytical procedures to use in evaluating the data.

Procedure: Details on this experiment have not been completely worked out. It will involve the drawing of samples from hypothetical populations and sampling field infestations. The work will be conducted by Judson McGuire as a thesis problem.

Line Project I-e-3-13

Surveys of Abundance, Distribution and Damage

E. W. Beck, Ankeny, Iowa

S-1 Abundance Surveys.

Purpose: To determine through formal survey procedures abundance of the European corn borer in the important corn growing regions of the United States to provide information upon the status of the insect in 1952.

Procedure: Active participation in field surveys will be limited to the immediate vicinity of the Ankeny Field Station. Every possible assistance and encouragement will be given cooperating State Agencies making corn borer surveys. Summaries of data supplied by cooperating State Agencies will be assembled in the form of a report to be published as Special Report of the Cooperative Economic Insect Report.

S-2 Distribution.

Purpose: To determine dispersion and distribution of the European corn borer in the United States.

Procedure: The search for new infestations will be limited to States requesting assistance. The scope of any search will be dependent upon availability of funds and experienced personnel.

S-3 Determination of Damage to Field Corn.

Purpose: (a) To continue investigations on a plot basis conducted in 1951 crop season to establish indices of damage caused by borers of first and second brood and infestation of combined broods.

(b) To determine amount of stalk breakage caused by each brood.

(c) To test visual and related methods of rating plant damage correlated with numbers of borers as apply to the fall survey of abundance.

(d) To obtain, incidentally, information on effect of insecticidal treatment on yield not attributable to induced differences in borer population.

Procedure: The standard method of inducing different levels of borer populations by placing different numbers of laboratory produced egg masses on plants will be followed. In this study 5x2 hill plots replicated 5 times will be used for each of 3 plantings of one hybrid. Plantings to be of a type representing early, midseason and late commercial plantings of field corn. Plots will be infested 0, 3, 6 and 12 egg masses per plant or fewer depending upon availability. One plot in each replicate will be treated with an insecticide and eggs will be removed manually also from one plot. In the midseason planting the series of egg masses will be applied during each brood both singly and in combination in a random series of plots. Samples will be taken at appropriate times to determine level of borer populations and data on silking, plant breakage, yield, and external evidences of damage will be obtained.

S-4 Estimates of Damage.

Purpose: To estimate loss caused by the insect to field corn in the United States.

Procedure: Dependent upon results of the experiment to determine indices of damage loss estimates will be prepared utilizing fall survey data and current estimates of production.

